away. There was now no caution about their departure, and no searching upon their return; they came and went with a zip and a whizz, in a manner very different from that when they first ventured forth in their new surroundings.

May I repeat the salient point of this behavior: to make a flight of orientation and a careful study of landmarks may have been an act of pure instinct, but to recognize, to know when and where to make such a flight, is an act of intelligence comparable with that of man under the same circumstances.

## NOTE ON A MIGRATION OF MOSQUITO LARVAE.

By Sherman C. Bishop and Richard C. Hart, University of Rochester.

In a forthcoming paper we give a brief account of some predacious enemies of the mosquito in Colorado and this record may be supplemented by a note on a remarkable migration of mosquito larvae, observed and photographed June 15, 1930, near Alamosa, Colorado.

The San Luis valley, in which the observations were made, is a broad, flat plain in south central Colorado having an elevation of about 7500 feet and flanked on either side by ranges of high mountains. The valley is extremely fertile under irrigation but otherwise dry except in the vicinity of streams, small lakes and artesian wells.

According to an estimate of the Monte Vista (Colorado) Commercial Club some 700,000 acres are under irrigation. Much of this land is in native-hay meadow and, with the practice of flooding, thousands of acres of ideal breeding places for mosquitoes are created each spring. Water stands on the meadows from a week to a month or more and reaches temperatures varying from 76° to 92° F. Under such conditions, certain species of Aedes may complete their development in seven or eight days. The problem is further complicated by the presence of hundreds of sloughs which, during periods of high water, are filled and usually retain enough water to bring off a generation of mosquitoes.

Many of the roads are bordered by ditches or "borrow pits" having no connection with the drainage or irrigation systems but
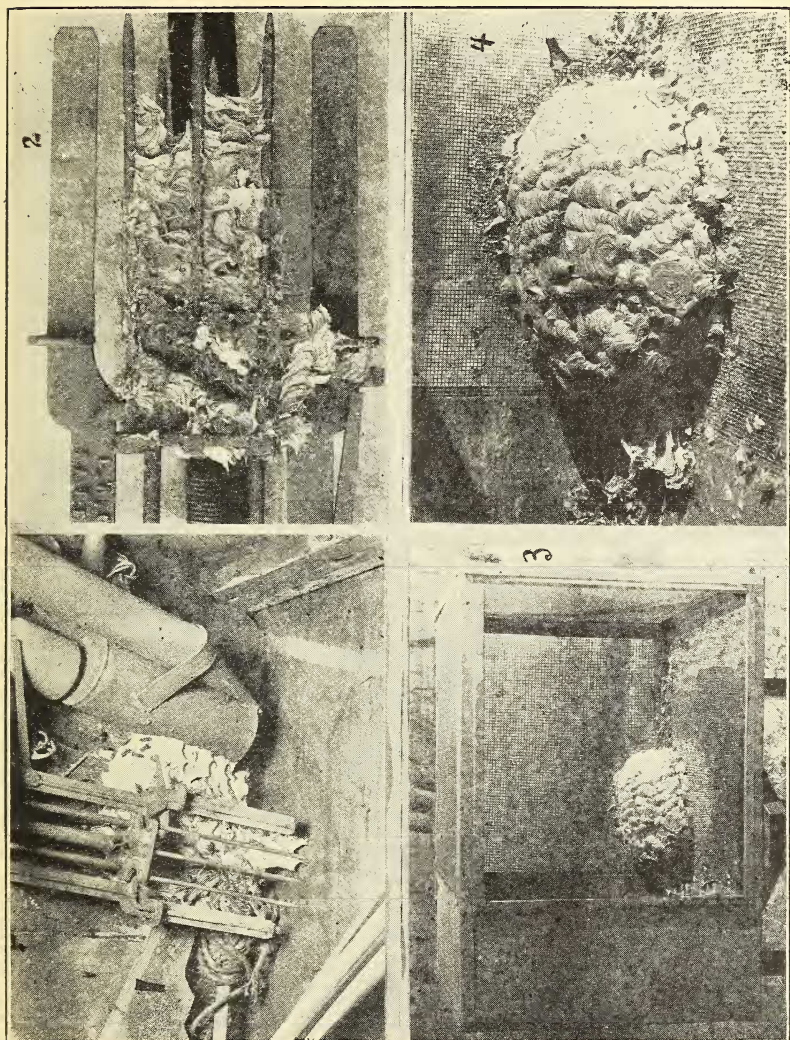
which fill by seepage from adjacent meadows. Frequently the water level of the ditch attains that of the bordering meadow and communication between the two is established at intervals. In such a situation the migration to be described below took place.

Local migrations had been observed from time to time as the larvae moved from the deeper sections of the ditch to the warmer grass-grown margins; but at the time when the great majority of the larvae had attained their full growth, a general exodus took place which utimately widely dispersed them over the adjoining meadows and left behind only an occasional pupa that had developed in advance of the movement.

The larvae moved uniformly in the only direction that would lead them to the open waters of the meadow. There was no discernible general movement of the water, for when silt was gently stirred from the bottom it hung in a cloud without drifting. The surface of the water, very slightly agitated by a light breeze, moved slowly in the direction opposite that taken by the larvae. The movement of the larvae was so general and striking we thought the event worthy of pictorial record and a Ciné-kodak was brought into use.

We timed a number of larvae in their transit across a white enamel plate used as a background against which to make our moving pictures. The plate was $8\frac{5}{8}$ inches in diameter and the average time of crossing 9.6 sec. Most of the larvae made one stop at the surface en route. If the same rate were continued, the larvae could travel about 54 inches per minute or 270 feet per hour.

The migratory movement continued until the larvae had travelled the entire length of the ditch, about two hundred yards, or until the place was reached where the water spread out to join that of the meadow. An examination of the ditch the following day revealed only a few precocious pupae that had been left behind. The vast majority of the larvae involved in the migration were *Aedes dorsalis* (Meigen).